



299-E33-286 (A7082)

Log Data Report

Borehole Information:

Borehole: 299-E33-286 (A7082)		Site: 216-B-35 Trench			
Coordinates (WA State Plane)		GWL (ft)¹: n/a ²		GWL Date: n/a	
North (m)	East (m)	Drill Date	TOC³ Elevation (ft)	Total Depth (ft)	Type
137272.5	573426.025	08/82	672.58	53.0	cable tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Steel (welded)	2.7	8.625	8.0	0.3125	0	53.0

Borehole Notes:

The casing depth and size information provided above are derived from direct measurements collected in the field by MACTEC-ERS personnel. The drilling date was derived from *Hanford Wells* (Chamness and Merz 1993). Coordinates and TOC elevation are derived from HWIS⁴. Chamness and Merz (1993) state that grout has been placed around the borehole to an unspecified depth.

Logging Equipment Information:

Logging System: Gamma 2B	Type: SGLS
Calibration Date: 11/01	Calibration Reference: GJO-2002-287-TAR
	Logging Procedure: MAC-HGLP 1.6.5, Rev. 0
Logging System: Gamma 1C	Type: HRLS
Calibration Date: 02/02	Calibration Reference: GJO-2002-309-TAR
	Logging Procedure: MAC-HGLP 1.6.5, Rev. 0

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2 Repeat			
Date	02/12/02	02/12/02			
Logging Engineer	Spatz	Spatz			
Start Depth (ft)	53.0	27.0			
Finish Depth (ft)	3.0	22.0			
Count Time (sec)	100	100			
Live/Real	R	R			
Shield (Y/N)	N	N			
MSA Interval (ft)	0.5	0.5			
ft/min	n/a	n/a			
Pre-Verification	A0082CAB	A0082CAB			
Start File	A0082000	A0082101			
Finish File	A0082100	A0082111			
Post-Verification	A0082CAA	A0082CAA			

High Rate Logging System (HRLS) Log Run Information:

Log Run	1				
Date	02/20/02				
Logging Engineer	Spatz				
Start Depth (ft)	26.5				
Finish Depth (ft)	51.5				
Count Time (sec)	300				
Live/Real	L				
Shield (Y/N)	N				
MSA Interval (ft)	0.5				
ft/min	n/a				
Pre-Verification	D0010CAB				
Start File	D0010000				
Finish File	D0010050				
Post-Verification	D0010CAA				

Logging Operation Notes:

SGLS and HRLS logging were performed in this borehole during February 2002. The reference depth for logging measurements is the top of casing. The HRLS was utilized to perform logging in high gamma flux zones, generally where SGLS dead time exceeded 40 percent. A data repeat section was collected in this borehole with the SGLS.

Analysis Notes:

Analyst:	Henwood	Date:	03/11/02	Reference:	MAC-VZCP 1.7.9, Rev. 2
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Pre-run and post-run verifications of the logging tools were performed for each day's log event. Acceptance criteria were not available for the SGLS; however, the data indicated correct performance of the logging system. Pre- and post-run verifications of the HRLS passed acceptance criteria. The post-verification data were applied to spectra for the energy and resolution calibrations.

A casing correction for 0.322-in.-thick casing was applied to the log data even though the field-measured thickness was 0.3125 in. This value is within the error of the field measurement and represents the published thickness for ASTM schedule-40 steel pipe, a common borehole casing at Hanford.

Each spectrum collected during a log run was processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Concentrations were calculated with EXCEL using an efficiency function and corrections for casing as appropriate. EXCEL templates named G2bNov01.xls and G1cFeb02.xls were used to process the SGLS and HRLS data, respectively. Dead time corrections are applied to log data, including the total gamma data, where the dead time is in excess of 10.5 percent. In zones of high dead time (> 40%), pulse pileup and peak spreading effects tend to result in underestimation of peak count rates. Actual concentrations may be significantly higher than reported values. The HRLS is utilized in zones of high SGLS dead times to quantify the ¹³⁷Cs concentrations. The ²¹⁴Bi peak at 1764 keV was used to determine the naturally occurring ²³⁸U concentrations rather than the ²¹⁴Bi peak at 609 keV. The 609-keV energy peak cannot be distinguished as a result of interference from the ¹³⁷Cs peak at 662 keV in higher concentration zones.

Log Plot Notes:

Separate log plots are provided for the man-made radionuclide (¹³⁷Cs), naturally occurring radionuclides (⁴⁰K, ²³⁸U, ²³²Th [KUT]), and a combination of man-made, KUT, total gamma and moisture, total gamma and dead time, and a repeat section; the moisture data were collected by Waste Management Federal Services NW in 1999. Data collected with the HRLS are plotted with the SGLS where appropriate to

provide a continuous record of man-made radionuclide concentrations over 0.5-ft intervals. In addition, a comparison plot of the SGLS, HRLS, and Waste Management's Radionuclide Logging System (RLS) ¹³⁷Cs concentration data is provided. A data repeat section of SGLS data shows good agreement in depth and concentration.

For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing corrections. These errors are discussed in the calibration report.

Results and Interpretations:

The man-made radionuclide detected in this borehole was ¹³⁷Cs. ¹³⁷Cs was detected between about 4 and 10 ft in depth and between about 26 ft and the total depth of the borehole. The maximum measured ¹³⁷Cs concentrations were about 50,000 pCi/g between about 37 and 40 ft.

The RLS ¹³⁷Cs concentration data compare favorably with the SGLS and HRLS data. The contaminant profile does not appear to have changed significantly since 1999.

The moisture data were collected in 1999 by Waste Management. Relatively high moisture exists between 23 and 26 ft and lies at depths just above the zone of high gamma flux that exists between 26 ft and total depth of the borehole.

The KUT logs do not delineate any definitive lithologic units. Changes in the ⁴⁰K concentrations from near 10 pCi/g at 25 ft to 17 pCi/g at about 52 ft suggest a lithologic change occurs in the high rate interval; this change could be at 26 ft where the ⁴⁰K concentrations appear to be increasing. This change is likely the transition from the coarse-grained sediments of the Hanford H1 unit to the finer grained sediments of the Hanford H2.

References:

Chamness, M.A. and J.K. Merz, 1993. *Hanford Wells*, PNL-8800, UC-903, Pacific Northwest Laboratory, Richland, Washington.

¹ GWL – groundwater level

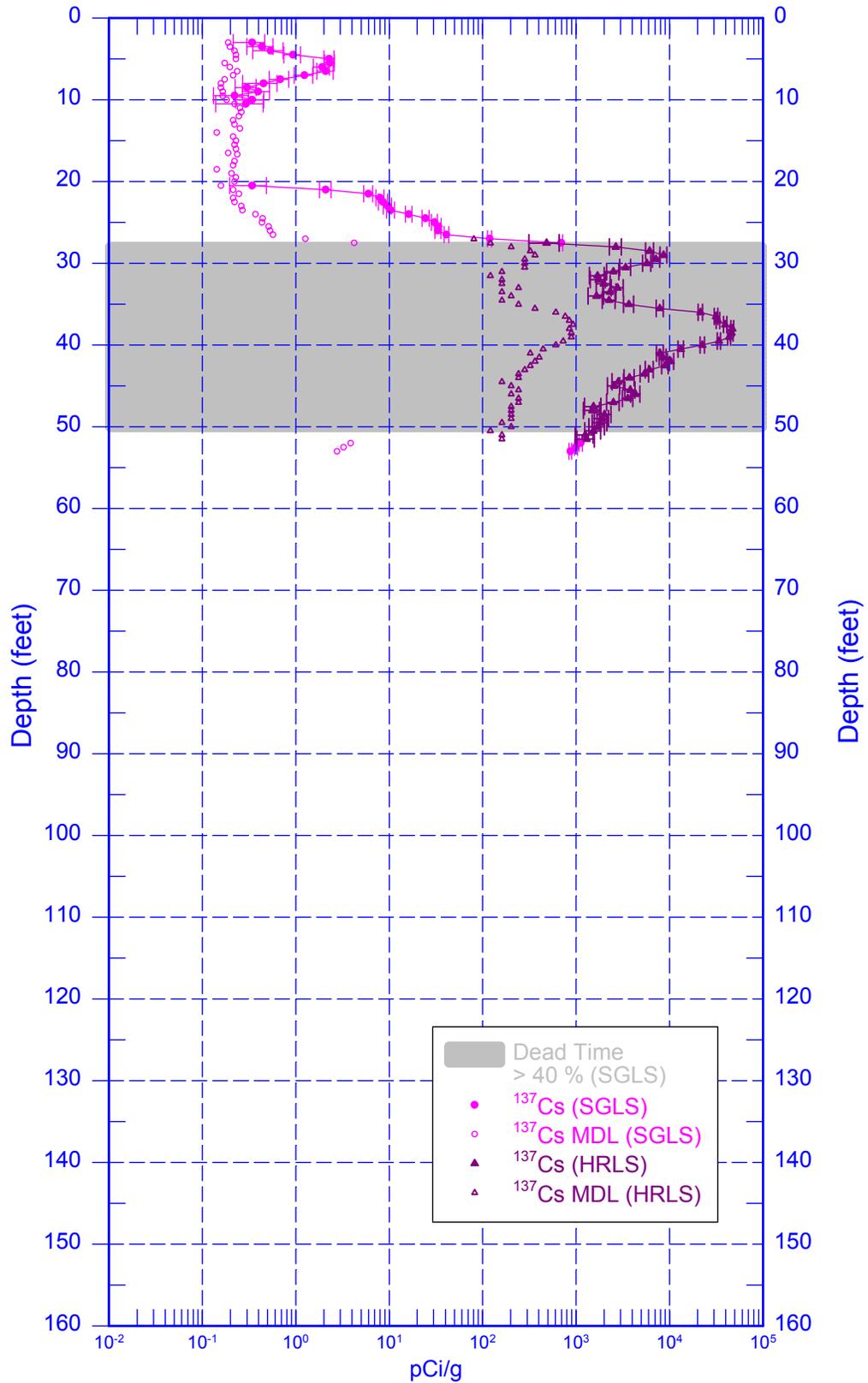
² n/a – not applicable

³ TOC – top of casing

⁴ HWIS – Hanford Well Information System

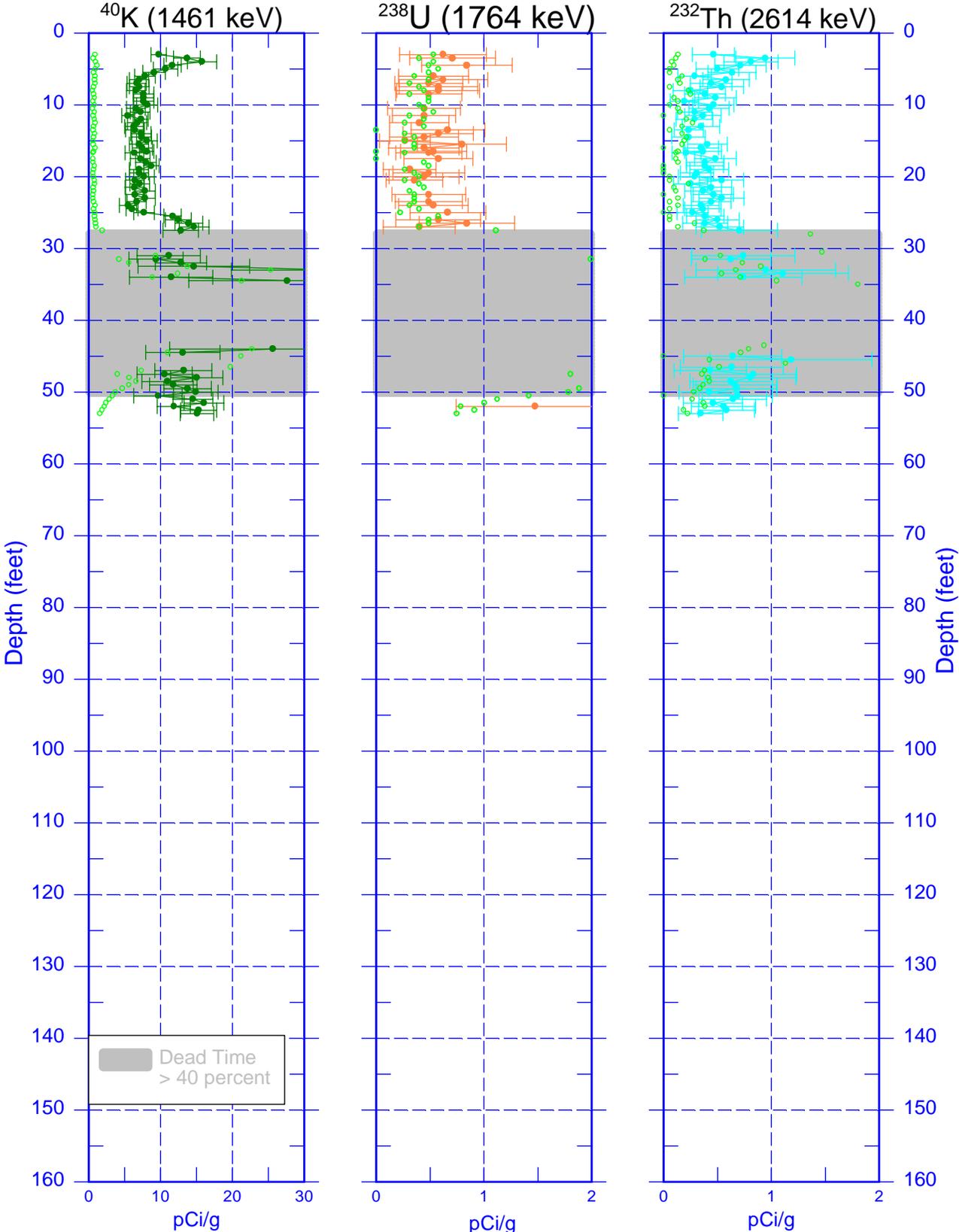
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Man-Made Radionuclide Concentrations



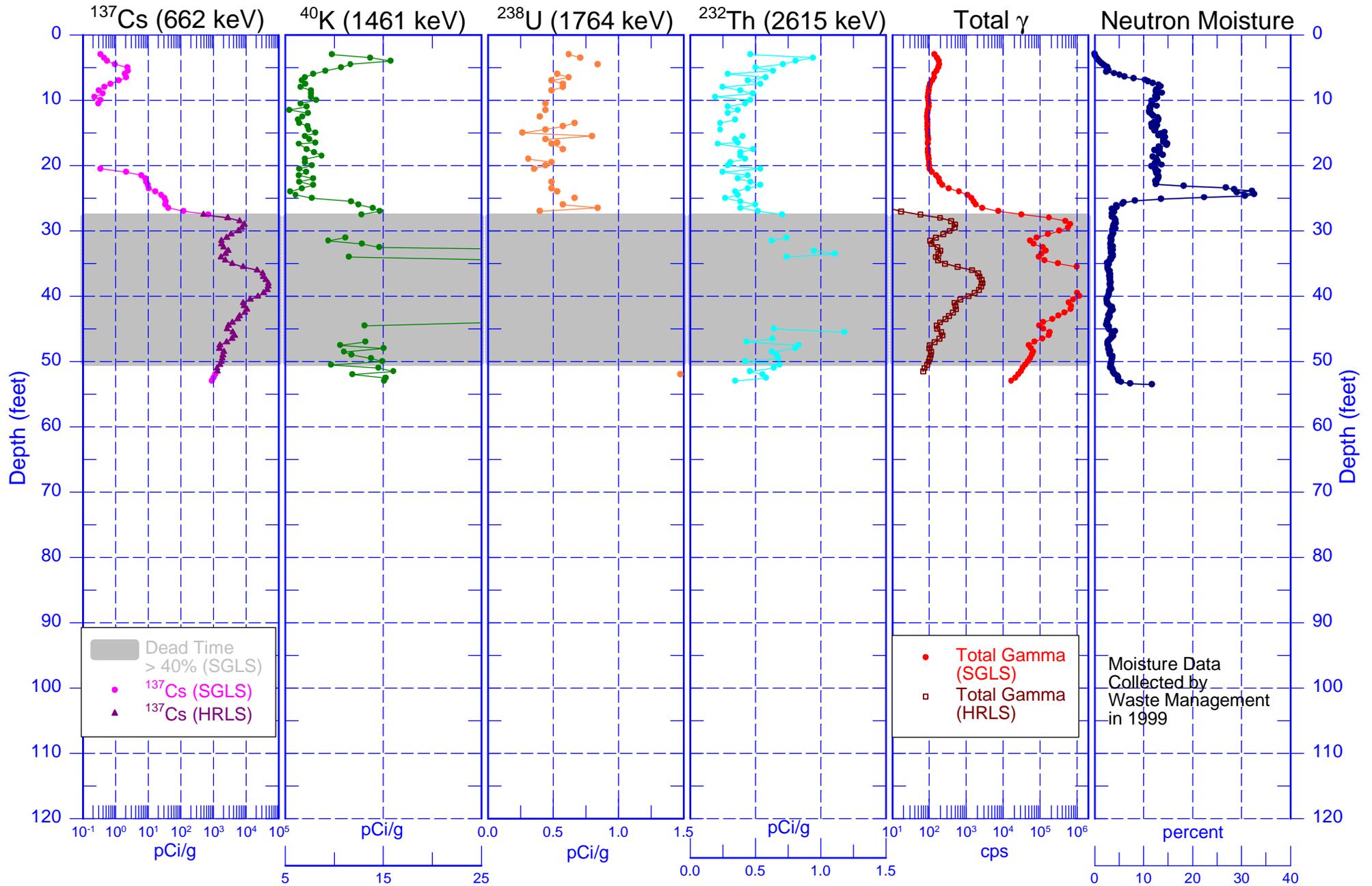
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Natural Gamma Logs



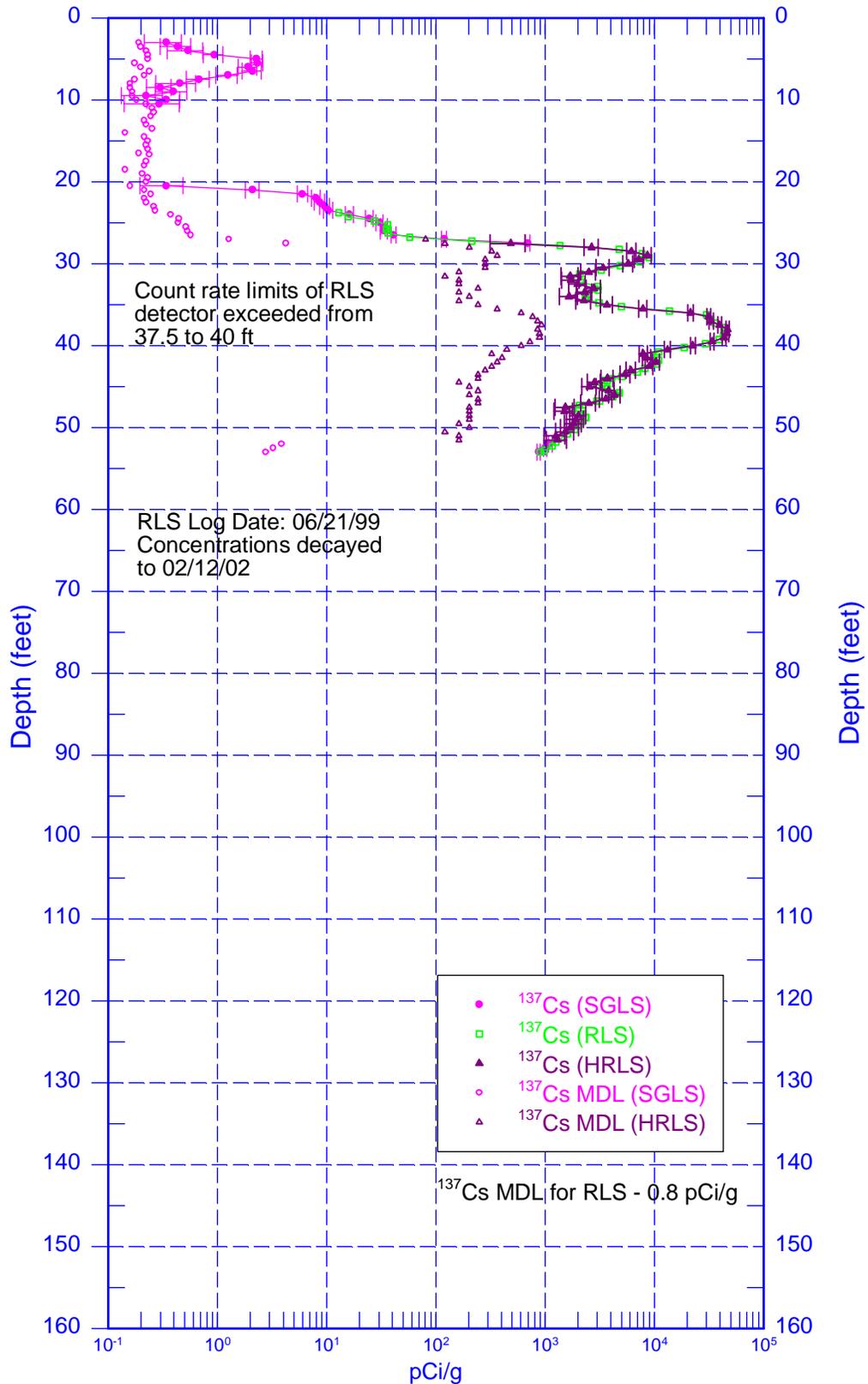
○ MDL

299-E33-286 (A7082) Combination Plot



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SGLS, HRLS, and RLS Comparison Logs



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Total Gamma & Dead Time

